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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,983	TOMOYASU ET AL.	
	Examiner	Art Unit	
	OLVIN LOPEZ	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16 and 19-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16 and 19-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application.
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to office action received on January 20, 2010.

Claims 1, 2, 4-8, 10-16, 25, 26, 32-35, 37, 40, 43, 49, and

53 are amended, Claims 17 and 18 are cancelled, and no new claims are added.

Accordingly, claims 1-16, and 19-53 are still pending in this application.

Priority

This application claimed the benefit of priority date of U.S. Provisional applications Nos. **60/454597, 60/454641, 60/454642, and 60/454644** filed March 17, 2006, which are incorporated by reference.

Applicant is reminded of the procedure of amended claims.

"Applicant should specifically point out support for any amendments made to the claims and disclosure". See MPEP 714.02 and 2163.06, and 37 CFR 1.111. A non responsive office action may be submitted for non-responsive amendments.

37 C.F.R. 1.111 (c) which states:

In amending in reply to a rejection of claims in an application or patent under reexamination, the applicant or patent owner must clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. The applicant or patent owner must also show how the amendments avoid such references or objections.

Response to Arguments

Applicant's argument/remarks, on page 14, with respect to objections to ***the title*** *have been fully considered and are persuasive. Therefore, objections to the title have been withdrawn due to the amendments.*

Applicant's argument/remarks, on page 14, with respect to objections to claims 1 and 5 have been fully considered and are persuasive. Therefore, objections to claim 1 and 5 have been withdrawn due to the amendments. See the now objections below.

Applicant's argument/remarks, on pages 14-15, with respect to rejections to claims **9-13, 22-30, 32 and 41-42 rejected under 35 U.S.C. 112, second paragraph,** *have been fully considered and are persuasive. Therefore, rejections to claims* **9-13, 22-30, 32 and** 41-42 *under 35 USC § 112 have been withdrawn due to the amendments.* ***See the now rejections below.***

Applicant's argument/remarks, on page 15, with respect to rejections to claims 1-12, 14-17, 19-23, 26, 31-33, 35, 37-44, and 46-53 under 35 U.S.C. 102(e) have been fully considered and are persuasive.

Therefore, rejections to claims 1-12, 14-17, 19-23, 26, 31-33, 35, 37-44, and 46-53 under 35 USC § 102(b) have been withdrawn due to the amendments. **However,**

upon further consideration, new grounds of rejection, which were necessitated by Applicant's amendments, have been made as discussed below.

Applicant's argument/remarks, on page 31-41, with respect to rejections to claims 13, 24-25, 27-30, 34, 36, and 45 under 35 U.S.C. 103(a) have been fully considered but the are not persuasive.

In the arguments applicant argues:

With regards to claim 13, *"The Applicants believe that the 103(a) rejections of Claim 13 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992)".*

Examiner respectfully disagrees with applicant.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Also, applicant is not considering the combination of Verbeke and Shoham

together. Moreover, applicant, uses the term "binning table", "bin algorithm" and "control recipe selection" interchangeably. As a result, claim 1 was interpreted in light of the specification. Shoham teaches a bin algorithm. However, examiner will include another reference to further clarify this limitation, see claim 13 below.

With regards to claims 23-24 and 28-29, applicant argues "*The Applicants do not claim a "carbon tetrachloride gas (CC14) as one of the etching gases used for etching of the object" as taught by Ishikawa, therefore, the Applicants believe the above assertion is incorrect, and the Applicants believe the rejection of Claims 23-24 and 28-29 should be withdrawn.*

The Applicants believe that the 103(a) rejections of Claims 23-24 and 28-29 are improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) ***rejection is based on improper hindsight reasoning,*** *and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).*

Examiner respectfully disagrees with applicant.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was

within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Also, applicant is not considering the combination of Verbeke and Shoham together.

Moreover, temperature of the substrate, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

With regards to claim 25, applicant argues "*The Applicants do not claim a "temperature controlled gas distribution system that controls the temperature of the gas inside there within a range of 35 to 75 to avoid the condensation and reactions of the gas inside the distribution system" as taught by Wang, therefore, the Applicants believe the above assertion is incorrect, and the Applicants believe the rejection of Claim 25*

should be withdrawn.

The Applicants believe that the 103(a) rejection of Claim 25 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992)".

With regards to claim 27, applicant argues "The Applicants do not claim a plasma process, therefore, the Applicants believe the above assertion is incorrect, and the Applicants believe the rejection of Claim 27 should be withdrawn.
The Applicants believe that the 103(a) rejection of Claim 27 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992).

With regards to claim 30, applicant argues "*The Applicants believe that the 103(a) rejection of Claim 30 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992)".*

Examiner respectfully disagrees with applicant with respect to claims 25, 27, 30.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Also, applicant is not considering the combination of Verbeke and Shoham together.

Moreover, the temperature of the process gas in the distribution system, temperature of the substrate holder, the temperature of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed*

ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.

With regards to claim 36, applicant argues "*The Applicants do not claim "A system for the research and development of films" as taught by Chondroudis, therefore, the Applicants believe the above assertion is incorrect, and the Applicants believe the rejection of Claim 36 should be withdrawn.*

The Applicants believe that the 103(a) rejection of Claim 36 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992)".

Examiner respectfully disagrees with applicant.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA

1971). Also, applicant is not considering the combination of Verbeke and Chondroudis together. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Chondroudis clearly teaches metrology data including goodness of fit data which is used to determine the thickness of each spectra collected in a substrate. A person of ordinary skill in the art would understand that a better determination of a desired output can be obtained with said information. Therefore, the combination provides a prima facie case of obviousness.

With regards to claim 45, applicant argues *"The Applicants do not claim a plasma process as taught by Rice, therefore, the Applicants believe the above assertion is incorrect, and the Applicants believe the rejection of Claim 45 should be withdrawn. The Applicants believe that the 103(a) rejection of Claim 45 is improper and should be withdrawn because the Applicants believe that the Examiner's obviousness (103a) rejection is based on improper hindsight reasoning, and the Examiner cannot "use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention" In re Fritch, 972 F.2d 1260, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992)".*

Examiner respectfully disagrees with applicant.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See In re McLaughlin, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Also, applicant is not considering the combination of Verbeke and Rice together.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Rice teaches using a wall heating element in a chemical process chamber. A person of ordinary skill in the art would have enough motivation to combine the teachings of Rice and Verbeke and Reiss to maintain the temperature of sidewalls and eliminate the problem of deposition and vaporizations on a quartz sidewall in a chemical process chamber as taught below. Therefore, the combination provides a prima facie case of obviousness.

Claim Construction

Applicant does not define the terms isolated data and nested data.

Applicant uses the terms "desired state" and "target CD (critical dimension)" in claim 1 having different meaning. However, the disclosure [0065], teaches these two terms as meaning the same. Therefore, examiner understands these two terms as meaning the same.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 1-2 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

With regards to claim 1, lines 13-14, recite "**one or more** exposed Tunable Etch Resistant ARC (TERA) film". Also, lines 7-9, recite "comprises isolated CD data for

at least one isolated feature and nested CD data for at least one nested feature CD data determined **using the at least one binning table"**. Moreover, 16-18, recite "a first target CD data" and "a second target CD data". This subject matter is not described neither in the current non-provisional application nor in the provisional applications from where this applications claims benefit of priority.

With regards to claim 2, lines 3-4, recite "post-process data comprises pre-qualified data for a processed substrate". This subject matter is not described neither in the current non-provisional application nor in the provisional applications from where this applications claims benefit of priority. Moreover, this amendment makes the claim unclear.

With regards to claim 12, lines 3-6, recite "selecting the control recipe having a pre-determined trim value approximately equal to the difference between pre-qualified CD data and pre-qualified target CD". This subject matter is not described neither in the current non-provisional application nor in the provisional applications from where this applications claims benefit of priority.

With regards to claim 35, lines 5-6, recite "determining the second delta based on the difference between CD data for the second feature **and pre-qualified target CD data".** This subject matter is not described neither in the current non-provisional

application nor in the provisional applications from where this applications claims benefit of priority.

2. **Claims 13, 33, and 35 are rejected** under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim13, line 1, recites "**creating** a binning table". The disclosure does not teach how this binning table is created. The disclosure teaches Fig. 9C a table which is already created and the values are selected from this already created table.

3. **Claim 33 was amended and line 5,** now recites, "comparing the isolated CD data and the nested CD **to a target CD**. The disclosure does not teach a third target CD, also it is not clear if this target CD data in claim 33 is the same or different from the target CD data as claimed in claim 1. Claim 33 depends on claim 1.

Moreover, claim 33 lines 3-4, recite "the process recipe is determined by comparing isolated CD data and the nested CD data to a target CD". Claim 1 also claims determining the process recipe by comparing the input state and the desired state. It is not clear which step has precedence or which step really determines the process recipe.

4. **Claim 35, line 4, recites** "the target CD data". Examiner it is not clear to which target CD data is applicant referring to. Claim 33 and claim 1 define a target CD data which according to claim 33 is different.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-12, 14-16, 19-23, 26, 31-33, 35, 37-44, and 46-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke et al in (US 20030045131) in view of Reiss et al (US 7337019).

With respect to claim 1, Verbeke teaches a method of processing a substrate by chemical oxide removal (COR) **(see title and paragraphs [0059] lines 9-10 and [0064] wafers are expose to hydrogen peroxide and) comprising**:

determining a desired state for the substrate, wherein the desired state comprises target critical dimension (CD) **(see Fig. 8A element 841 report Critical dimension CD, and paragraph [0082] lines 1-8)** data determined using at least one binning table;

receiving pre-process metrology data for the substrate **(see Fig. 8A element 810),** wherein the pre-process metrology data defines an input state for the substrate **(see Fig. 8A element 830, and paragraph [0080] lines 1-4, [0082] lines1-9)** and comprises isolated CD data for at least one isolated feature and nested CD data for at least one nested feature CD data determined using the at least one binning table **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated and nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature);**

determining a process recipe by comparing the input state with the desired state **(see Fig. 8a elements 840-880 the target and reference states of a wafer are compared and a recipe is determined to continue processing the wafer, see paragraphs [0083]-[0090] for the whole process, see specifically paragraph [0090]),** wherein the isolated CD data and the nested CD data are compared to the target CD data **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated and nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature);** and

processing the substrate using the process recipe by chemically altering one or more exposed Tunable Etch Resistant **("layered". Applicant does not define this term. Verbeke teaches the tunable etch resistant ARC film as supported by Angelopoulos (US 6514667) where he defines tunable as "layered")** ARC (TERA) film **(see [0062] "An example of the use of etch/strip tool 600 is for the patterning of a conductive film or stack of conductive films into features used in an integrated circuit. The film can be a stack of metal films which include a main conductor 1001 and a barrier layer 1003 and an antireflective coating (ARC) 1005)** surface layers on the substrate and then thermally treating the chemically altered exposed TERA film surface layers **(see paragraph [0061] lines 1-5, [0062] and [0063] lines 1-2, see paragraph [0090] "to determine the etch recipe at step 880, said recipe used to adjust the etch processing of the lot". Finally see claim 13 below for more support)**,

wherein a first delta is determined based on the difference between CD data for a first feature and first target CD data **(see paragraph [0085] lines 9-11 and [0086]);**

a second delta is determined based on the difference between CD data for a second feature and second target CD data **(see paragraph [0085] 11-14 and [0086]);**

and a TERA film trimming process is performed based on the difference between the first delta and the second delta and the chemically altered exposed TERA film surface layers are evaporated during the TERA film trimming process **(see paragraph [0086] lines 6-13 se Fig. 8A and 10B).**

Verbeke does not explicitly teach a binning table **(a control recipe selection method as taught by the disclosure)** is used for determining the target critical data.

However, Reiss in an analogous art, teaches a control system using a binning table **(a control recipe selection method)** for determining a target critical data to process a wafer **(see Col 5 lines 47-67 "see FIG. 2, a control system 200 implementable by semiconductor manufacturing system 100 is illustrated. As shown in FIG. 2, control system 200 includes a control process 210, fault detection process 220, run-to-run process 230, and wafer measurement process 240. Control process uses a control algorithm. Control process 210 may be responsible for selecting a tool or process recipe used to process a wafer. This process recipe may be inputted into system 200 by, for example, a process engineer. The recipe identifies, in part, a desired outcome or final product to be produced, as specified by any number of target properties. These target properties may include for example a final desired film thickness to be produced by a CMP tool. In addition, control process 210 also receives any number of pre wafer measurements 214 from, for example, an upstream metrology tool. These measurements describe to control process 210 the characteristics of an incoming wafer, and are used to determine the recipe setpoints, as will be discussed below).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke's invention and have used a method of inspecting a wafer using an algorithm

which include generating a reference wafer and generating a grid of bins to compute a standard deviation in each bin as taught by Shoham to control the polishing of a wafer **(see abstract, see Figs. 3A-3C, see Col 12 lines 31-33 ad lines 49-53, Col 14 lines 15-20 and lines 39-51, and Table 2 teaches the bins).**

With respect to claim 2, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, the method further comprising:

Verbeke further teaches receiving post-process metrology data for the substrate, wherein the post-process metrology data defines an output state and comprises pre-qualified CD data for a processed substrate **(see Fig. 8A elements 860 and 880 paragraph [0065]) ;**

determining if the desired state has been achieved **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated or nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature).**

determining a new process recipe when the desired state has not been achieved **(see Fig. 8A element 880);** and

transferring the substrate when the desired state has been achieved **(see paragraph [0103] lines 1-3 "If the CD measurements of wafer 1000 are found to be in**

compliance with desired results, then wafer 1000 is removed from CD module 700 and brought into transfer chamber 610 by robot 612").

With respect to claim 3, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, **Verbeke further teaches** wherein the pre-process metrology data comprises Optical Digital Profiling (ODP) data **(see paragraph [0079] Optical imager 710 can utilize scatterometry or reflectometry techniques which are ODP).**

With respect to claim 4, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 2, wherein the post-process metrology data comprises Optical Digital Profiling (ODP) data **(see paragraph [0079] Optical imager 710 can utilize scatterometry or reflectometry techniques which are ODP see Fig. 8A. a feedback and feed-forward of data).**

With respect to claim 5, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 4, **Verbeke further teaches** wherein the post-process metrology data comprises Scanning Electron Microscope (SEM) data **(see paragraph [0081] imager can be a CD SEM).**

With respect to claim 6, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, **Verbeke further teaches** wherein the

pre-process metrology data comprises at least one to-be-controlled CD and the process recipe is determined by comparing the at least one to-be- controlled CD to a target CD **(see paragraph [0078] the width of photo-resist feature formed on an incoming wafer and see Fig. 8a elements 840-880 the target and reference states of a wafer are compared and a recipe is determined to continue processing the wafer if needed, see paragraphs [0083]-[0090] for the whole process, see specifically paragraph [0090]).**

Reiss further teaches wherein the pre-process metrology data comprises at least one to-be-controlled CD and the process recipe is determined by comparing the at least one to-be- controlled CD to a target CD (see Fig. 4 the at least one to be controlled CD is taught as a limit or range within an output needs to be to be acceptable).

With respect to claim 7, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 6, **Verbeke further teaches** wherein the at least one to-be-controlled CD is larger than the target CD and the processing includes performing the TERA film trimming process **(see Fig. 10A and 10B). (see paragraph [0078] the width of photo-resist feature formed on an incoming wafer and see Fig. 8a elements 840-880 the target and reference states of a wafer are compared and a recipe is determined to continue processing the wafer if needed, see paragraphs [0083]-[0090] for the whole process, see specifically paragraph [0090]).**

Reiss further teaches wherein the pre-process metrology data comprises at least one to-be-controlled CD and the process recipe is determined by comparing the at least one to-be- controlled CD to a target CD (see Fig. 4 the at least one to be controlled CD is taught as a limit or range within an output needs to be to be acceptable. Such limits can be upper or lower than the desired output).

With respect to claim 8, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 7, wherein the TERA film (**see Fig. 10A element 105 and claim 1 above)** trimming process comprises:

Verbeke further teaches executing a chemical oxide removal (COR) process recipe for a COR module, wherein exposed TERA film surfaces on the substrate are chemically treated using a process gas **(see paragraph [0106]),** wherein a solid reaction product is formed on at least one TERA film exposed surface **(see Figs. 10A-10E see paragraph [0102] and [0144] "FIG. 14A-14C show chamber body 1445 that defines reaction chamber 1490 in which the thermal decomposition of a process gas or gases takes place to form a film on a wafer e.g., a CVD reaction");**

and executing a post heat treatment (PHT) process recipe for a PHT module by executing comprises evaporating the solid reaction product, thereby trimming the chemically treated exposed TERA film surface layers **(see Figs. 10A- 10 E and [0063]);**

With respect to claim 9, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 8, further comprising:

Verbeke further teaches repeating the COR process recipe executing and the PHT process recipe executing until the at least one to-be-controlled CD is approximately equal to the target CD **(see paragraph [0102] lines 30-46).**

With respect to claim 10, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in 9, further comprising:

Verbeke further teaches receiving post-process metrology data, wherein the post-process metrology data defines an output state and comprises measured CD data for a processed substrate **(see paragraph [0102] lines 30-46)**;

determining if a measured CD is approximately equal to a target CD **(see Figs. 8A and 8B and paragraph [0102]);**

repeating the COR process recipe executing and the PHT process recipe executing when the measured CD is not approximately equal to a target CD **(see Figs. 8A and 8B and paragraph [0102]);** and

stopping the execution steps when the measured CD is approximately equal to a target CD **(see Figs. 8A and 8B and paragraph [0102] as its is shown in Figs. 8A and 8B the method of processing a wafer is repeated until a predetermined threshold value is approximately reached also see [0103] If the CD measurements of wafer 1000 are found to be in compliance with desired results,**

then wafer 1000 is removed from CD module 700 and brought into transfer chamber 610 by robot 612).

With respect to claim 11, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 7, **Verbeke teaches** further comprising determining a trimming amount **(see paragraph [0080] and [0102] the optical imager 710 measures CD and profile of certain patterns on photo resist layer ... when these CD measurements are out of compliance the method of Figs. 8A-8B is performed),** wherein the TERA film trimming process **(see paragraph [0102] –[103])** includes :

executing a chemical oxide removal (COR) process recipe for a COR module **(see paragraph [0104]),** wherein exposed surfaces on the substrate are chemically treated using a process gas **(see Fig. 4 or Fig. 9 these chambers ca be used for the trimming process),** wherein a solid reaction product having a thickness approximately equal to the trimming amount is formed on at least one exposed surface; and

executing a post heat treatment (PHT) process recipe for a PHT module by evaporating the solid reaction product **(see Figs. 10A- 10E see paragraph [0102] and [0059] A cleaning process may be performed in the cleaning chamber 400 by exposing the substrate 480 to energized process gas comprising cleaning gas to, for example, remove remnant resist and/or to remove or inactivate etchant residue remaining on the substrate after the substrate is etched");**

thereby trimming at least one of the chemically treated exposed surfaces by the trimming amount **(see Figs. 10A to 10E).**

With respect to claim 12, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 11, further comprising:

examining a number of pre-qualified control recipes, wherein each control recipe has at least one pre-determined trim value **(see paragraph [0082] and see Fig. 8A);** and

selecting the control recipe having a pre-determined trim value approximately equal to the difference between pre-qualified CD data and pre-qualified target CD **(see paragraph [0082] and see Figs. 8A and 8B)**.

With respect to claim 14, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 11, further comprising:

creating a lookup table containing a number of pre-qualified control recipes **(see paragraph [0082] "a reference library is created");** and

performing a table lookup to determine the process recipe **(see paragraph [0123] "The change in process parameters would be determined by complex controller 124 from a stored look up table or formula which relates the process parameters to the particle scan of wafer 1600"). It is obvious that if the controller accesses a look up table to access information on parameters, first the controller or user**

had to have created the look up table for predetermined recipes with acceptable values as shown in step 810.

With respect to claim 15, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 8, wherein the executing a COR process recipe comprises:

transferring the substrate into a module comprising a chemical treatment chamber **(see Fig. 9 substrate 930 is placed in holder 940);**

positioning the substrate on a temperature controlled substrate holder mounted within the chemical treatment **chamber (see Fig. 9 element support 940 for holding wafer 930 and see paragraph [0095]) ;**

altering chamber pressure using a vacuum pumping system coupled to the chemical treatment chamber **(see Fig. 9 element 962 and see paragraph [096] lines 1-6 and [0099] "A throttle valve 200 is provided in the exhaust for controlling the pressure in chamber 910");**

providing the process gas using a gas distribution system coupled to the chemical treatment chamber and configured to introduce at least one process gas into the chemical treatment chamber **(see Fig. 9 element 964);** and

controlling the COR module, the temperature controlled substrate holder, the vacuum pumping system, and the gas distribution system according to the process recipe **(see paragraph [0105] lines 6-9, [0114] lines 4-6, [0185] and [0245] Processor 720 executes the system control software and provides and**

receives control signals for the tool which controls the transfer of wafers through the tool and which provides the specific control signals necessary to achieve the specific processing parameters for each of the modules coupled to the tool, such as process temperature, process gas/fluid flows and process pressure. Also as shown in Figs. 8A and 8B only where there is a difference between the target and the measured CD the system will modify the recipes already store for every process (etch, stripping, trimming etc) and the parameters for every step might be changed accordingly).

With respect to claim 16, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 8, wherein the executing a PHT process recipe comprises:

transferring the substrate into a module comprising a thermal treatment chamber; positioning the substrate on a temperature controlled substrate holder mounted within the thermal treatment chamber **(see paragraph [136] lines 1-3 and Fig. 13A elements substrate 1361, holder 1362, and rotating cylinder 1363 substrate is positioned on holder 1362 and see paragraph [0182] and [0183]);**

altering the chamber temperature using a temperature controlled upper assembly coupled to thermal treatment chamber **(see paragraph [0191] lines 1-5 and Fig. 13A elements 1319);**

altering chamber pressure using a vacuum pumping system coupled to the thermal treatment chamber **(see Fig. 14 element 1431 and paragraph [0149] and**

[0190] "pressure is pumped down"); and

controlling the PHT module, the vacuum pumping system, temperature control system, and the temperature controlled substrate holder according to the process recipe **(see paragraph [0105] lines 6-9, [0114] lines 4-6, [0185] and [0245] Processor 720 executes the system control software and provides and receives control signals for the tool which controls the transfer of wafers through the tool and which provides the specific control signals necessary to achieve the specific processing parameters for each of the modules coupled to the tool, such as process temperature, process gas/fluid flows and process pressure. Also as shown in Figs. 8A and 8B only where there is a difference between the target and the measured CD the system will modify the recipes already store for every process (etch, stripping, trimming etc) and the parameters for every step might be changed accordingly).**

(the method of using apparatus 1200 shown in Figs. 12 to 16D is explained in paragraphs [0180]-[0222]).

With respect to claim 19, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke further teaches** wherein the process gas comprises a fluorine-containing gas and a nitrogen- containing gas **(see paragraph [0062] lines 9-11).**

With respect to claim 20, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 19, **Verbeke further teaches** wherein the process gas comprises HF and NH3 **(see paragraph [0062] lines 9-11 "NH3" and paragraph [0108] lines 13-14 any gas or vapor containing hydrogen can serve as a gas and [0053] cleaning chemicals such as diluted HF).**

With respect to claim 21, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 8, **Verbeke further teaches** wherein the process gas comprises a first gas and a second gas that are independently introduced to a processing space **(see paragraph [0147] lines 1-7 also see Fig. 2A).**

With respect to claim 22, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke further teaches** wherein the temperature of the temperature controlled substrate holder in the chemical treatment chamber ranges from approximately 10° C to approximately 50° C **(see paragraph [0106] the holder acts as a cathode with a temperature of about 50° C).**

With respect to claim 23, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke further teach** wherein the temperature of the substrate mounted on the temperature controlled substrate holder in the chemical treatment chamber ranges from approximately 10° C to approximately 50° C **(see paragraph [0218] lines 19-21).**

With respect to claim 26 and 32, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke further teaches** further comprising controlling the temperature of a chemical treatment chamber wall within a range from approximately 30° C. to approximately 100° C **(see paragraph [0141] lines 10-12).**

With respect to claim 31, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 16, further comprising:

Verbeke further teaches positioning the substrate at a first distance from the temperature controlled upper assembly during a first time **(see paragraph [0146])**; and

positioning the substrate at a second distance from the temperature controlled upper assembly during a second time **(see paragraph [0150] , also as it is shown in Figs. 8A-8B in all of the process steps, after a wafer has been processed it can be sent to the metrology apparatus and if the desired output has not been achieved the wafer is reprocessed and sent back to the process chamber see paragraph [0185]).**

With respect to claim 33, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, **Verbeke further teaches** wherein the pre-process metrology data comprises an isolated CD data for at least one isolated feature and nested CD data for at least one nested feature, and the process recipe is

determined by comparing the isolated CD data and the nested CD data to a target CD **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated or nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature).**

With respect to claim 35, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 33, further comprising:

Verbeke further teaches determining the first delta based on the difference between CD data for the first feature and the target CD data **(see paragraph [0085] lines 9-11 and [0086]);**

determining the second delta based on the difference between CD data for the second feature and pre-qualified target CD data **(see paragraph [0085] 11-14 and [0086]);**

and

performing a trimming process based on the difference between the first delta and the second delta **(see paragraph [0086] lines 6-13 se Fig. 8A and 10B).**

With respect to claim 37, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, further comprising:

Verbeke further teaches receiving post-process metrology data for the substrate, wherein the post-process metrology data defines an output state and comprises CD data for a processed substrate **(see Fig. 8A elements 860 and 880 paragraph [0065] and [0086] lines 1-6)**;

computing a predicted state for the substrate based on the process characteristics and a process model **(see paragraph [0088] lines 10-12) ;**

determining if the predicted state has been achieved by comparing the output state with the predicted state **(see paragraph [0090]);** and

computing a process model offset when the predicted state has not been achieved **(see paragraph [0086] and [0087] lines 1-4 and [0090] also see Fig. 8A and 8B adjustments are made to the recipe when differences are found between the averaged value of a lot or several wafers and the next wafer).**

With respect to claim 38, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 1, **Verbeke further teaches** wherein the process recipe is determined by executing a control strategy and a control plan **(see paragraph [0091] lines 1-6).**

With respect to claim 39, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 8, further comprising:

Verbeke further teaches transferring the substrate from the COR module to the PHT module **(See paragraph [0102] lines 43-46 [0104], [0105] wafer is etched and [0141]**

lines 1-7).

With respect to claim 40, Verbeke teaches a processing system for treating a substrate comprising **(see paragraph [0045]):**

Verbeke teaches a processing subsystem comprising a chemical oxidation removal (COR) module for chemically altering Tunable Etch Resistant ARC (TERA) film **("layered". Applicant does not define this term. Verbeke teaches the tunable etch resistant ARC film as supported by Angelopoulos (US 6514667) where he defines tunable as "layered". Also, see [0062] "An example of the use of etch/strip tool 600 is for the patterning of a conductive film or stack of conductive films into features used in an integrated circuit. The film can be a stack of metal films which include a main conductor 1001 and a barrier layer 1003 and an antireflective coating (ARC) 1005)** exposed surface layers on the substrate **(see Fig. 12 element 200 and Figs. 15A-15E and paragraph [0182]),** a post heat treatment (PHT) module for thermally treating the chemically altered exposed TERA film surface layers on the substrate **(see [00131] lines 1-3),** and an isolation assembly coupled between the PHT module and the COR module **(see Fig. 12 the isolation assembly is taught as the transfer chamber 1224);**

a first integrated metrology module **(IMM)** coupled to the processing subsystem for providing pre-process metrology data**(see Fig. 12 element 1290, see paragraph [0126] lines 10 integrated thickness monitoring tool),** wherein the pre-process metrology data comprises isolated CD data for at least one isolated feature and nested

CD data for at least one nested feature CD data determined using the at least one binning table **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated and nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature);** and

a control device coupled to the processing subsystem and the first IMM **(see Fig. 12 element 124)** , wherein the control device determines a process recipe for changing the substrate from an input state to a desired state; and

executes the process recipe **(see paragraph [0123] "information gained from the surface monitoring can be used by controller 124 to determine the process parameters for stripping the silicon nitride 1604 on subsequent wafers and can be used to determine cleaning parameters for cleaning subsequent wafer in wet cleaning module 200 and see paragraph [0245] FIG. 20A illustrates a computer/controller 124 which can be used to control the movement and processing of a wafer in a tool, such as tool 100, 600, 1200 and 1800 in accordance with the present invention),**

wherein a first delta is determined based on the difference between CD data for a first feature and first target CD data **(see paragraph [0085] lines 9-11 and [0086]);**

a second delta is determined based on the difference between CD data for a second feature and second target CD data **(see paragraph [0085] 11-14 and [0086]);**

and a TERA film trimming process is performed based on the difference between the first delta and the second delta and the chemically altered exposed TERA film surface layers are evaporated during the TERA film trimming process **(see paragraph [0086] lines 6-13 se Fig. 8A and 10B).**

Verbeke does not explicitly teach a binning table **(a control recipe selection method as taught by the disclosure)** is used for determining the target critical data.

However, Reiss in an analogous art, teaches a control system using a binning table **(a control recipe selection method)** for determining a target critical data to process a wafer **(see Col 5 lines 47-67 "see FIG. 2, a control system 200 implementable by semiconductor manufacturing system 100 is illustrated. As shown in FIG. 2, control system 200 includes a control process 210, fault detection process 220, run-to-run process 230, and wafer measurement process 240. Control process uses a control algorithm. Control process 210 may be responsible for selecting a tool or process recipe used to process a wafer. This process recipe may be inputted into system 200 by, for example, a process engineer. The recipe identifies, in part, a desired outcome or final product to be produced, as specified by any number of target properties. These target properties may include for example a final desired film thickness to be produced by a CMP tool. In addition, control process 210 also receives any number of pre**

wafer measurements 214 from, for example, an upstream metrology tool. These measurements describe to control process 210 the characteristics of an incoming wafer, and are used to determine the recipe setpoints, as will be discussed below).

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke's invention and have used a method of inspecting a wafer using an algorithm which include generating a reference wafer and generating a grid of bins to compute a standard deviation in each bin as taught by Shoham to control the polishing of a wafer **(see abstract, see Figs. 3A-3C, see Col 12 lines 31-33 ad lines 49-53, Col 14 lines 15-20 and lines 39-51, and Table 2 teaches the bins).**

With respect to claim 41, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 40, **Verbeke further teaches** wherein the COR module further comprises a temperature controlled chemical treatment chamber **(see Fig. 12 element 1400 and see Figs. 14A-14B and see paragraph [0144] lines 8-12),** a temperature controlled substrate holder mounted within the chemical treatment chamber and configured to be substantially thermally insulated from the chemical treatment chamber **(see Fig. 14A and 14B see [0144] "resistive heater 1480 holding susceptor 1405 holds a substrate also see paragraph" [0152] lines 9-17 and [0154] "pyrometers provides data about the surface of the susceptor"),** a vacuum pumping system coupled to the chemical

treatment chamber **(see Fig. 14A element 1431)**, and a temperature controlled gas distribution system for introducing one or more process gases into the chemical treatment chamber **(see Fig. 14A element gas mixing).**

With respect to claim 42, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 40, **Verbeke further teaches** wherein the PHT module further comprises a temperature controlled thermal treatment chamber **(see Fig.13A and paragraph [0027]),** a temperature controlled substrate holder mounted within the thermal treatment chamber and configured to be substantially thermally insulated from the thermal treatment chamber **(see paragraph [136] lines 1-3 and Fig. 13A elements substrate 1361, holder 1362, and rotating cylinder 1363 made of quartz which is a known insulator),** and a vacuum pumping system coupled to the thermal treatment chamber **(see Fig. 13A element 1353)**.

With respect to claim 43, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 40, **Verbeke further teaches** wherein the control device further comprises means for controlling at least one of a chemical treatment chamber temperature, a chemical treatment gas distribution system temperature, a chemical treatment substrate holder temperature, a chemical treatment substrate temperature, a chemical treatment processing pressure, a chemical treatment gas flow rate, a thermal treatment chamber temperature, a thermal treatment substrate holder temperature, a thermal treatment substrate temperature, and a thermal treatment

processing pressure **(see paragraph [0245] lines 1-3 and 14-17).**

With respect to claim 44, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 40, **Verbeke further teaches** wherein the isolation assembly comprises at least one of a thermal insulation assembly, a gate valve assembly, and a transfer system **(see Fig. 12 the isolation assembly comprises transfer chamber 1224 and transfer mechanism 1226);**

With respect to claim 46, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 41, **Verbeke further teaches** wherein the temperature controlled gas distribution system comprises at least one gas distribution plate, the gas distribution plate comprising one or more gas injection orifices **(see Fig. 14A element gas mixing and element 1420 and see paragraph [0145] and [0147] blocker plate 1424 to distribute the gas and perforated plate 1425 distribute the gas about an area consistent with the surface area of a wafer).**

With respect to claim 47, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 41, **Verbeke further teaches** wherein the temperature controlled substrate holder in the chemical treatment chamber comprises at least one of an electrostatic clamping system, a back-side gas supply system, and one or more temperature control elements **(see paragraphs [0095] "electrostatic**

chuck 950 with grooves 955 in which a coolant gas, such as helium, is held to control the temperature of the substrate 930" and [0154] lines 10-19 "pyrometers provides data about the surface of the susceptor" and also a thermocouple 1470).

With respect to claim 48, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 41, **Verbeke further teaches** wherein the temperature controlled substrate holder in the chemical treatment chamber includes one or more temperature control elements **(see paragraph [0154] lines 10-19 "pyrometers provides data about the surface of the susceptor" and also a thermocouple 1470).**

With respect to claim 49, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 41, **Verbeke further teaches** wherein the gas distribution system comprises a first gas distribution plenum and a first gas distribution plate having a first array of one or more orifices and a second array of one or more orifices for coupling a first gas to a process space through the first array of one or more orifices in the first gas distribution plate, and a second gas distribution plenum and a second gas distribution plate having passages therein for coupling a second gas to the process space through the passages in the second gas distribution plate and the second array of one or more orifices in the first gas distribution plate **(see paragraph [0145] and [0147] "The first gas distribution plate 1424, when coupled**

to the gas sources trough port 1420, forms a first gas distribution plenum. Additionally, the second gas distribution plate 1425, when coupled to the first gas distribution plate 1424 forms a second gas distribution plenum").

With respect to claim 50, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 49, wherein the first gas and the second gas are independently introduced to the process space **(see paragraph [0147] and paragraph [0217] lines 1-10).**

With respect to claim 51, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 42, **Verbeke further teaches** wherein the PHT module further comprises a substrate lifter assembly coupled to the thermal treatment chamber for vertically translating the substrate between a transfer plane and the substrate holder **(see paragraph [0146] lines 1-12 "specifically line 11 recites a lifter assembly 1460").**

With respect to claim 52, Verbeke in view of Reiss teaches the processing system as recited in claim 40, **Verbeke further teaches** wherein the processing subsystem is coupled to a manufacturing system **(see paragraph [0079] lines 1-11 and [0246]).**

With respect to claim 53, Verbeke in view of Reiss teaches the processing system as recited in claim 40, **Verbeke further teaches** wherein the control device also determines if the desired state has been achieved **(see paragraph [0123] lines 14-26 and [0245]).**

1. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss et al in view of Shoham et al (US 7042564).

With respect to claim 13, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 11, further comprising:

Verbeke teaches creating a binning table, each bin containing a pre-determined trim value **(see paragraph [0082] "a reference library is created");**

selecting the bin having a pre-determined trim value approximately equal to the difference between the pre-process CD data and the target CD **(see paragraph [0123] "The change in process parameters would be determined by complex controller 124 from a stored look up table or formula which relates the process parameters to the particle scan of wafer 1600"). It is obvious that if the controller accesses a look up table to access information on parameters, first the controller or user had to have created the look up table or formula for predetermined recipes with acceptable values as shown in step 810)**; and

selecting the pre-qualified control recipe associated with the bin as the process

recipe **(see Figs. 8A and 8B a recipe is selected if the measured feature matches the target feature).**

Reiss teaches the binning table (see claim 1 above). **However, Verbeke in view of Reiss does not explicitly teach creating the binning table.**

Shoham teaches a method of creating a binning table using an algorithm which include generating a reference wafer and generating a grid of bins **(see Col 12 lines 49-53)** to compute a standard deviation in each bin to control the polishing of a wafer **(see abstract, see Figs. 3A-3C, see Col 12 lines 31-33 ad lines 49-53, Col 14 lines 15-20 and lines 39-51, and Table 2 teaches the bins).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss invention and have used a method of creating a binning table using an algorithm which include generating a reference wafer and generating a grid of bins **(see Col 12 lines 49-53)** to compute a standard deviation in each bin to control the polishing of a wafer **(see abstract, see Figs. 3A-3C, see Col 12 lines 31-33 and lines 49-53, Col 14 lines 15-20 and lines 39-51, and Table 2 teaches the bins).**

2. **Claims 23-24, and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke et al, in view of Reiss, and further in view of Ishikawa et al (US 5240556).**

With respect to claim 23, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke in view of Reiss does not teach** wherein the temperature of the substrate mounted on the temperature controlled substrate holder in the chemical treatment chamber ranges from approximately 10° C to approximately 50° C**.**

Ishikawa, in an analogous art, teaches the temperature of the substrate mounted on the temperature controlled substrate holder in the chemical treatment chamber is heated at about at least room temperature (approx 23 C) to prevent the surface of the semiconductor wafer from attachments of droplets when the semiconductor is unloaded in the air **(see Col 3 lines 21-26).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have kept the temperature of the substrate mounted on the temperature controlled substrate holder in the chemical treatment chamber heated at about at least room temperature (approx 23 C) **as taught by Ishikawa to** prevent the surface of the semiconductor wafer from attachments of droplets when the semiconductor is unloaded in the air **(see Col 3 lines 21-26).**

Moreover, temperature of the substrate, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process.

Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

With respect to claims 24 and 29, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15 and claim 16, **Verbeke in view of Reiss does not explicitly teach** wherein the chemical treatment chamber pressure ranges from approximately 1 mTorr to approximately 100 mTorr**.**

Ishikawa teaches the chemical treatment chamber pressure is kept at low-pressure atmosphere (e.g. 75 mTorr) **(see Col 7 lines 37-42)** for activating an etching gas activated in a low-pressure atmosphere.

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss invention and have kept the chemical treatment chamber pressure at low-pressure atmosphere (e.g. 75 mTorr) **(see Col 7 lines 37-42)** as taught for Ishikawa for activating an etching gas activated in a low-pressure atmosphere **(see Col 3 lines 36-39).**

Moreover, temperature of the substrate, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

With respect to claim 28, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 16, **Verbeke in view of Reiss does not teach** wherein the temperature of the substrate mounted on the temperature controlled substrate holder in the thermal treatment chamber ranges from approximately 10° C to approximately 50° C.

Ishikawa teaches the object is preferably heated at a temperature falling within a range of 50 to 100.degree. C. because carbon tetrachloride gas (CCl.sub.4) as one of the etching gases used for etching of the object has a relatively low boiling point, the etching gas deposited on the surface of the object can be sufficiently discharged by

heating at the above temperature and also since a normal photo resist has a heat resistance of 120 to 140.degree. C., the resist is not thermally affected by heating at the **temperature (see Col 3 lines 51-61).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have kept the substrate heated at a temperature falling within a range of 50 to 100.degree. C. **as taught by Ishikawa** because carbon tetrachloride gas (CCl.sub.4) as one of the etching gases used for etching of the object has a relatively low boiling point, the etching gas deposited on the surface of the object can be sufficiently discharged by heating at the above temperature and also since a normal photo resist has a heat resistance of 120 to 140.degree. C., the resist is not thermally affected by heating at the **temperature (see Col 3 lines 51-61).**

Moreover, temperature of the substrate, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where*

the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.

3. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss in view of Wang et al in (US 5354715).

With respect to claim 25, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 15, **Verbeke teaches** temperature controlled conduits. However, **Verbeke in view of Reiss does not teach** further comprising controlling the temperature of the process gas in the gas distribution system within a range from approximately 30° to approximately 100° C.

Wang, in an analogous art, teaches a temperature controlled gas distribution system that controls the temperature of the gas inside there within a range of 35 to 75 to avoid the condensation and reactions of the gas inside the distribution system **(see Fig. 12 and Col 10 lines 61-68 and Col 11 lines 11-13 also see line 45 and line 62 and see Col 18 lines 5-18).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have used a temperature controlled gas distribution system that controls the temperature of the gas inside there within a range of 35 to 75 Celsius degrees **as taught by Wang** to avoid the condensation and reactions of the gas inside the distribution system **(see Fig. 12 and**

Col 10 lines 61-68 and Col 11 lines 11-13 also see line 45 and line 62 and see Col 18 lines 5-18).

Moreover, temperature of the substrate holder, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

4. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss in view of Kawakami et al in (US 5542559).

With respect to claim 27, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 16, **Verbeke in view of Reiss does not teach** wherein the temperature of the temperature controlled substrate holder in the thermal treatment chamber ranges from approximately 10° C to approximately 50° C.

Kawakami, in an analogous art, teaches a treatment apparatus that maintains the temperature of a substrate holder in a range of 10 to -100 (which falls in the above range) degree in order to prevent any possible electrical discharge between a lower electrode and a grounded member during a etching **process (see abstract and Col 1 lines 9-65 and Col 6 lines 57-62).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have used a treatment apparatus that maintains the temperature of a substrate holder in a range of 10 to -100 (which falls in the above range) degree **as taught by Kawakami** in order to prevent any possible electrical discharge between a lower electrode and a grounded member during an etching **process (see abstract and Col 1 lines 9-65 and Col 6 lines 57-62).**

Moreover, temperature of the substrate holder, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the*

case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.

5. **Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss et al in view of Yamazaki et al in (US 6803246).**

With respect to claim 30, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 16, **Verbeke in view of Reiss does not teach** wherein the temperature of the thermal treatment chamber ranges from approximately 10° C to approximately 50° C.

Yamakazi, in an analogous art, teaches a thermal treatment chamber wherein the temperature ranges from approximately 10° C to approximately 50° **(see Col 21 claim 5)** to process a substrate.

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have used a thermal treatment chamber wherein the temperature ranges from approximately 10° C to approximately 50° **(see Col 21 claim 5)** as taught by Yamazaki to process a substrate.

Moreover, temperature of the substrate holder, the pressure of the chambers, and flow rates of the gases, it is the examiners position that these are known results effective variables in the art, where each of the process parameters claimed are known to directly effect the a deposition or cleaning process and the overall effectiveness of

the process. Therefore it would have been obvious to one skill in the art at the time of the invention was made to determine the optimal value for the flow rates, the pressure, and the power source used in the process of the prior art, through routine experimentation, to effectively and predictably deposit the desired seasoning coating as well as to effectively and predictably clean the process chamber. Alternatively, in *the case where the claimed ranges "overlap or lie" inside ranges disclosed by prior art a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257 191 USPQ 90. See MPEP 2144.05.*

6. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss et al in view of Official Notice Taken.

With respect to claim 34, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 33, further comprising:

Verbeke further teaches performing a first trimming process based on the difference between the isolated CD data and the target CD data **(see Fig. 10B and paragraph [0104]); and**

performing a second trimming process based on the difference between the nested CD data and the target CD data **(see Fig. 10B and paragraph [0104]) ; Verbeke teaches the method of comparing** wherein the pre-process metrology data comprises an isolated CD data for at least one isolated feature and nested CD data for at least one nested feature, and the process recipe is determined by comparing the

isolated CD data and the nested CD data to the target CD **(see paragraph [0084] "the target feature is imaged by imager 710 at step 830, and its waveform is stored as a target waveform see paragraph", [0102] lines 29-46 and see Figs. 10A-10E critical dimension of an isolated or nested data is produced from the images taken from the features 1004. if the measurements taken are out of compliance the wafer is processed until complies with a target feature. Verbeke further teaches a well known method of trimming a feature of a wafer to reduce its dimension (as shown in Fig. 10B). It was well know in the art at the time of the invention that a trimming process to reduce the dimension of a critical dimension or gate line width would increase a microchip functionality Official notice Taken.** It would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have used the target feature data compared against an isolated feature data to perform a first trimming process on a wafer as shown in Fig. 10 B, and also have used the target feature data against a nested feature data to perform a second trimming process on a wafer as shown in Fig. 10 B since the trimming process is well known in the art that can increase the functionality of a microchip (wafer).

7. **Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss et al in view of Chondroudis et al in (US 20040071888).**

With respect to claim 36, Verbeke in view of Reiss teaches the method of processing a substrate as claimed in claim 33, Verbeke teaches wherein the pre-

process metrology data includes goodness-of-fit (GOF) data, and depth data **(paragraph [0055] integrate particle monitor to determine the shape of a wafer and, [0126] an integrated thickness monitoring tool 1290 to [0180] "measure of the deposited gate film on the wafer the thickness of a wafer" see also [0185] lines 1-6).** However , **Verbeke in view of Reiss does not teach** that the pre-process metrology data includes goodness of fit.

Chondroudis teaches a method for measuring the thickness of a film using **goodness of fit** data to compare the spectra model to extract the refractive index and thickness of each spectra collected and to identify films having desirable properties **(see paragraphs [0002] lines 6-9 and [0130]).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above have used a technique for measuring the thickness of a film using **goodness of fit** data **as taught Chondroudis** by to compare the spectra model to extract the refractive index and thickness of each spectra collected to identify films having desirable properties **(see paragraphs [0002] lines 6-9 and [0130]).**

8. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verbeke in view of Reiss et al in view of Rice et al in (US 5477975).

With respect to claim 45, Verbeke in view of Reiss teaches the processing system for treating a substrate as claimed in claim 41, **Verbeke further teaches**

wherein the temperature controlled chemical treatment chamber comprises a wall heating element **(see paragraph [0144] heater 1480). Verbeke in view of Reiss does not teach** said heating element is a wall heating element.

Rice, in an analogous art, teaches a wall heating element to maintain the temperature of sidewalls to eliminate the problem of deposition and vaporizations on a quartz sidewall **(see Col 3 lines 16-25).**

Therefore, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to which said subject matter pertains to have modified Verbeke and Reiss combination as taught above and have used a wall heating element as taught by Rice to maintain the temperature of sidewalls and eliminate the problem of deposition and vaporizations on a quartz sidewall **(see Col 3 lines 16-25).**

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The reference Okano (US 5591486) teaches a "Method for forming a film on a substrate by activating a reactive gas" that comprises two chambers a chemical treatment chamber and a thermal treatment chamber, gas distribution system and so on.

The reference Ritzdorf (US 20030020928) teaches "Methods and apparatus for processing microelectronic work pieces using metrology" that discloses all the subject matter of claims 1 and 40. Ritzdorf clearly teaches using a user interface to input and select target physical characteristics.

The reference Betawar et al (US 6665575) teaches "a recipe editor to cerate process recipes using a table".

The reference Brown (US 6864041) teaches a method of fabricating a chip comprising determining Isolated and Nested data and controlling a target CD based on the difference between the Isolated and nested data and the target data.

The reference Yamashita (US 7328418) teaches a method of etching a substrate comprising reducing nested and isolated features in the substrate. This reference includes several limitations recited in claims 1-53 of the present application.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **OLVIN LOPEZ** whose telephone number is (571)270-7686. The examiner can normally be reached on Mondays thru Thursdays and alternate Fridays from 7:30 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Albert Decady,** can be reached on (571)-272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

/O. L./
Examiner, Art Unit 2121

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